Policy, Research, and External Affairs

WORKING PAPERS

Population, Health, and Nutrition

Population and Human Resources
Department
The World Bank
July 1991
WPS 723

Improving Women's and Children's Nutrition in Sub-Saharan Africa

An Issues Paper

Olayinka Abosede
and
Judith S. McGuire

Nutrition is the number one health concern in Africa — and nutrition programs can be a magnet for attracting community support to the health system, especially maternal-child health programs. But nutrition is often a secondary concern of health policy, often ignored in food policy, and too often left out of training programs and work plans.

Policy, Research, and External Affairs

WORKING PAPERS

Population, Health, and Nutrition

WPS 723

This paper — a product of the Population, Health, and Nutrition Division, Population and Human Resources Department — is part of a larger study undertaken by PRE of African health policy. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Otilia Nadora, room S6-065, extension 31091 (30 pages).

The main sources of malnutrition in Africa, as elsewhere, are inadequate food intake, excessive disease, maternal malnutrition, and deleterious food and health behavior (such as abrupt weaning, the early or late introduction of nonbreastmilk foods and liquids, the intrahousehold allocation of nutrients away from nutritionally vulnerable members of the family, the withdrawal of food during diarrhea, and poor food and sanitation practices).

Abosede and McGuire review several successful innovative approaches to addressing nutrition problems in Africa: the Iringa Nutrition Program in Tanzania, the Zimbabwe Children's Supplementary Feeding Program, the Zaire Weaning Foods Processing Program, and the Senegal Growth Promotion Program.

They identify the lessons from these programs, including the need:

- To involve the community actively in program development.
- For training in nutrition at all levels, from doctor to village health worker.
- For strong growth monitoring and nutrition education components.
- For close supervision, including regular supervisory visits to villages and health huts, discussions with clients, and observations.
- For a variety of institutional and financing mechanisms.

Africa's nutrition problems require many of the same services as problems elsewhere — growth monitoring, nutrition education, targeted feeding, and food fortification. Africa shares the universal need for good training, mangement, communications, and information systems.

But new and innovative institutional mechanisms are needed to address Africa's nutrition problems. Each country must look for its own institutional strengths and weaknesses in developing nutrition programs.

Produced by the PRE Dissemination Center

Improving Women's and Children's Nutrition in Sub-Saharan Africa: An Issues Paper

by
Olayinka Abosede
and
Judith S. McGuire

Table of Contents

IMPROVING WOMEN'S AND CHILDREN'S NUTRITION IN SUBSAHARAN AFRICA: ISSUES PAPER

By Olayinka Abosede, M.D., Johns Hopkins University
and Judith S. McGuire, Ph.D., World Bank

The subject of this issues paper is the appropriate role of nutrition in health policy in Africa. Food security (the ability of all people to acquire adequate food at all times), is excluded from this analysis because that has been the subject of another document[1]. There are a number of overlapping concerns between food security and health, however. Seasonal undernutrition is ubiquitous throughout Africa and can be addressed through the health system as well as through food policies. Micronutrient deficiencies seem to fall into both areas also. They will be dealt with in this paper because many solutions lie outside the purview of food security.

The format of this brief issues paper is as follows. First the relevant data concerning malnutrition in Africa will be analyzed. Next the causality of nutrition problems will be presented. Then we will discuss what is known about current programs to combat malnutrition. Finally, we will summarize the major issues which emerge from the foregoing analysis and make some recommendations for further analysis. This issues paper will be used to develop more detailed background paper which builds on several case studies of successful program implementation in Africa.

I. RATIONALE

Nutrition improvement must play a fundamental role in human resource development. A malnourished child has greater morbidity, mortality, and developmental delays than a well-nourished child. A person malnourished in utero and in early childhood has a reduced capacity to take advantage of health, education and employment opportunities. An undernourished or anemic adult has submaximal capacity to perform his or her work--whether that work is in the market, for subsistence, in household production, or for reproduction.

- In the Gambia it was found that seasonal food shortages caused food intake among pregnant women to drop significantly at the time that their agricultural workload increased tremendously with the result that many women pregnant women lost weight and the prevalence of low birthweight increased from 13% to 35%.[2] Prenatal supplementation of these women during the preharvest season was able to decrease the proportion of low birth weight babies by about 80%.

- In Benin investigators found that anemic women--55% of pregnant women--gave birth

---

1 Report of the Task Force on Food Security in Africa. World Bank, 1988.

2 Immink, M., F.E. Viteri, R. Flores and B. Torun. 1984. "Macroeconomic Consequences of Energy Deficiency in Rural Populations in Developing Countries" in E. Pollitt and P. Amante, Eds., Energy Intake and activity, vol. 11, Current Topics in Nutrition and Disease (New York, NY, Alan R. Liss, Inc.).

to iron-deficient infants.[3]

- In Nigeria children under 80% expected weight-for-age had 33% increase duration of diarrhea.[4]

- In Kenya, a Bank supported research project showed anemia to be a significant determinant of work productivity. For each standard deviation above the mean hemoglobin level there was a 5.6% increase in productivity of men and women road workers.[5]

- In Sierra Leone a study of 125 households found that household calorie intake made a large and significant contribution to farm output with an elasticity of 0.34 overall and 0.49 for the lowest tercile.[6]

- In Uganda one of the classic nutrition studies found that undernourished children under 3 years of age were able to grow at a normal rate only by reducing physical activity by about 20% (per kg. body weight). Lethargic children do not improve motor or mental skills as rapidly as active children.[7]

- In Zaire investigators found that child mortality was associated with marked deceleration in linear growth in the months preceding death.[8]

- Severe vitamin A deficiency can cause blindness and death. Even moderate vitamin A deficiency has been implicated as a cause of elevated morbidity and mortality. Sixteen African countries have vitamin A deficiencies affecting 53 million children but only 8 million are covered by supplementation programs.

- Iodine Deficiency Disorders (IDD) cause mental retardation, stillbirths and neurological disorders. One hundred million people in Africa are at risk of developing IDD. Except in the Equator region of Zaire, iodine deficiency control programs are implemented only on a limited scale.

- Anemia reduces work productivity, impairs immune function, reduces school performance and increases the risk of low birth weight and maternal hemorrhage at

---

3 Hercberg, S. et al. Nutritional anemia in pregnant Beninese women: consequences on the haematological profile of the newborn. British J. Nutrition 57: 185-193, 1987.

4 A. Tomkins. Nutritional Status and Severity of Diarrhea among Preschool Children in Rural Nigeria. Lancet j: 860-862, 1981.

5 Wolgemuth, J.C. et al. Worker productivity and the nutritional status of Kenyan Road laborers. Amer. Journal of Clinical Nutrition 36: 68-78, 1982.

6 J. Strauss. Does better nutrition raise farm productivity? J. Political Economy 94 (2: 297-320, 1986).

7 I.H.E. Rutishauser and R.G. Whitehead. Energy intake and expenditure in 1-3 year old Ugandan children living in a rural environment. Brit. J. Nutr. 28: 145-152.

8 W. Van Lerberghe. "Linear Growth Retardation and Mortality" in J.C. Waterlow, ed. Linear Growth Retardation in Less Developed Countries. Nestle Nutrition Workshop Series, Vol. 14. New York, Raven Press, 1988.

birth. In Africa over half of preschool children and nearly 2/3 of pregnant women are anemic largely due to iron deficiency.

- Iron supplements and iron fortification are available and highly cost-effective solutions[9] yet such programs are unavailable to a large proportion of the population in subsaharan Africa.

9 H.M. Levin. "A Benefit-Cost Analysis of Nutritional Programs for Anemia Reduction." World Bank Research Observer. I (2):219-245, 1986.

II. NATURE OF THE PROBLEM

Nearly 30% of preschool children in Africa are underweight and this proportion has grown since the 1960's[10] (Table 1). Nutritional problems in Africa are both structural - to the extent they are related to poverty and poor infrastructure -and precipitous (due to droughts and wars). The problems relate to proteins and micronutrients as well as to calories for very young children. Nearly every African country has a significant nutrition problem (Appendix). According to the ACC/SCN, no country in subsaharan Africa, has improved its nutrition status since 1980 (Figure 1), and anthropometric indicators have shown mixed performance (Figure 2). Africa also has the highest infant mortality rate and under-5 mortality rate of all regions in the world[11] which is in large part a product of poor nutrition (Figure 3).

The protein calorie nutrition problem is primarily a rural problem (Table 2), although the peri-urban slums often harbor severe undernutrition. Aside from iron deficiency anemia (Table 3), which is ubiquitous, micronutrient deficiencies tend to be concentrated either geographically (Table 4, Figures 4-5) or by sociocultural group within each country. Preschool aged children and women of reproductive age are particularly vulnerable to nutritional stresses (Tables 5). Iron and vitamin A availability in the African diet has deteriorated relative to energy supplies (Figure 6).

III. CAUSALITY

Malnutrition in Africa, as elsewhere, derives from four major sources: inadequate food intake, excessive disease, maternal malnutrition and deleterious food and health behaviors. These causes act synergistically to undermine nutritional status.

First, food intake is low, highly variable over seasons, and often of low nutrient density (Table 6, Figure 7). Roots and tubers, in particular, have an insufficient protein content to support growth in children. Maize based diets lack niacin as well as certain key amino acids. Monotonous grain or tuber based diets often provide insufficient micronutrients and even hinder absorption of those same nutrients. During the dry season, leaves, fruits and vegetable sources of micronutrients may be lacking. Dietary energy in the food supply increased slowly between 1960 and 1980 but it has worsened in this decade (Figure 8).

High disease burdens--especially diarrhea and parasites--increase nutritional needs at the same time that they hinder absorption. Poor access to basic health services and inadequate knowledge worsen the nutrition-infection cycle. The seasonal (and often year round) poor access to water adds further stress to the system--not only because of reduction in the quality and quantity of water, but also because of the time and energy burden of water procurement, a load borne primarily by women. There is a marked seasonality of malnutrition (Figure 9) and it closely parallels the seasonality of diarrhea (Figure 10).

Maternal malnutrition (including short stature which is a vestige of childhood undernutrition) contributes to low birth weight and submaximal household productivity. An undernourished woman can neither work at her potential in the fields, in the home or in childbearing. Low birthweight infants are at

---

10 Judith McGuire, Malnutrition: Opportunities and Challenges for A.I.D. 1988.

11 Subcommittee on Nutrition of the United Nations Administrative Coordinating Committee. First Report on the World Nutrition Situation, 1987. ACC/SCN, 1987.

higher mortality risk. Anemic and underweight women face greater reproductive risks. Low birthweight averages about 16% in Subsaharan Africa (Table 5) and maternal weight fluctuates seasonally (Figure 11) often the detriment of birthweight.

Food and health behaviors can either compensate for or exacerbate the environmental nutrition risks. Abrupt weaning, early or late introduction on non-breastmilk foods and liquids, intra-household allocation of nutrients away from nutritionally vulnerable individuals, withdrawal of food during diarrhea, and poor food and sanitation practices can all detract from nutrition. In three Subsaharan countries where nutritional status data are disaggregated by age, the 12-23 month old children are worst off (Table 7), suggesting that weaning poses high health risks. At the same time, certain traditional practices are very good for nutrition and need to be preserved--breastfeeding, for instance, traditional preservation techniques, and persistent child feeding during illness can promote good nutrition.

IV. POSSIBLE SOLUTIONS

Increasing household food security must play a major role in improving nutrition in Africa. The strategies for doing so have been presented by the Task Force on Food Security in Africa and therefore will not be discussed here. Much needs to be done in the health sector, in direct nutrition interventions and in the fields of child spacing and basic education. Improving the health environment and the capacity of the health care system is necessary to improve nutrition. Environmental sanitation, diarrheal disease control, immunization, child spacing and curative care are dealt with elsewhere in the Africa Health Policy Paper. The health system must also be able to handle nutrition directly just as competently as it deals with pills and immunizations. Growth promotion, nutrition education, prenatal nutrition supplements, and treatment of severe malnutrition should form a central set of responsibilities of primary health care workers.

Beyond integrated health nutrition programs, direct nutrition programs are needed, including targeted food supplementation programs, nutrition and consumer education, micronutrient fortification, and school feeding. The specific programs depend on national capacity and the nutrition problems at hand.

There is an increasing awareness of the need for integrated early childhood programs which provide health care, nutrition and mental stimulation in the context of childcare. Women's time and energy is stretched too thin, especially in the pre-harvest season, for women to take care of the children's health and nutrition adequately. Therefore easing women's burden must be uppermost in policymakers' minds as they consider ways to improve nutrition.

Lessons learned from nutrition programs elsewhere in the world are instructive but for a number of reasons, Africa cannot simply clone nutrition programs from other regions. Africa is different--population density is lower, seasonality more dramatic, population growth higher and agroecological conditions more variable. Africa also has lower levels of urbanization and worse physical infrastructure, as a whole, than other regions.

Several innovative approaches to addressing nutrition problems have been carried out successfully in Africa. A quick review of some of these experiences can identify the major policy issues concerning nutrition in Africa.

Iringa Nutrition Program, Tanzania

In Tanzania, the Iringa Nutrition Program, funded by the Joint Nutrition Support Program and the Tanzanian government, resulted in undernutrition (less than 80% Harvard median) falling from 55.9% in 1984 (second quarter) to 38% in 1988 (second quarter).[12] The recurrent cost was about $8 per year per child. The program was comprised of five substantive interventions: maternal child health, water and sanitation, household food security, childcare, and income generation for women. In addition, there were separate components for institution building, research, and management. The MCH program was particularly interesting and instructive. The level of community involvement through village health committees was extremely high and one of the focal points was growth monitoring of preschool-aged children. The nutritional data were used not only as an educational tool for health workers and mothers, but also were used to raise consciousness at the community level. The childcare component was also particularly innovative and successful. It not only tried out non-maternal childcare institutions, but it also attempted to give women the necessary resources to facilitate better maternal childcare. In particular, Kimea (power flour) was developed and produced as a means of making family porridge more appropriate for infant feeding. Kimea is a fermented grain product that makes the thick porridge semi-liquid. Daycare centers and child feeding posts were developed by village committees using local resources (food, school teachers, village day care workers, mothers).

The lessons learned from the Tanzanian experience are that community participation is not only feasible but crucial to program adaptation and success. Second, measuring the growth of children (weight-for-age) is an effective tool for consciousness raising, planning, education, and evaluation. Third, village institutions can be used to extend and expand the public health care system. Fourth, some technological breakthroughs, like Kimea, can be introduced and have a significant effect on nutrition.

Zimbabwe Children's Supplementary Feeding Program[13]

In 1980, shortly after independence, a consortium of non-governmental organizations, public health and social service authorities, used the administrative structure developed by the liberation forces during the war to develop an emergency feeding cum nutrition education program. Although originally designed as a refugee program, the CSFP gradually became more of a village-based nutrition program over the next three years. The foods used were either locally grown or food aid commodities that were the same as local foods. The program was targeted to those geographic areas most severely affected by the war. Screening within communities was done using an armband, applied by the local worker who had been trained in its use. One of the most valuable aspects of this program, in addition to intensive community participation, was the nutrition education strategy. One basic message was passed on: children need groundnuts, beans and oil in addition to cornmeal (the local starchy staple). Mothers of at-risk children prepared the food, which is also an educational tool. Administrative streamlining was done by prepackaging the food supplements for monthly allotments for every ten children. As the program changed to a permanent one, the food aid was replaced by local production on communal plots. This was also educational since groundnuts had previously been used as cashcrops instead of feeding them to children. The Health Ministry took the lead in developing the program but the Ministry of Agriculture has come to play a significant role.

The program had a positive effect on nutrition. The 1981 evaluation showed that children

---

12 JNSP Iringa 1983-1988 Evaluation Report. Photocopy, Oct. 1988.

13 D. Sanders. The Children's Supplementary Feeding Programme in Zimbabwe. "Contact: Special Series on Food and Nutrition. Christian Children's Commission, Geneva 1985. Pages 125-128.

in the program gained weight at twice the rate of non-program children and that more frequent participation was associated with greater impact. The CSFP created an institution - a network of village - based nutrition centers -that has since been used to respond to droughts.

Zaire Weaning Foods Processing[14]

An innovative program in Zaire using food aid commodities, non-governmental organizations and private as well as public sector has shown that institutional innovation can effectively deliver nutrition sources to target groups. This project encompasses private production and marketing of a weaning food, maize production and marketing support, and distribution of maize mixed with soy flour through maternal child health programs.

A private firm (Victoria Associated Products, VAP) uses local maize and soy to produce a nutritionally balanced weaning food called CEREVAP. They purchased an extruder to allow them to replace imported maize with local maize. The CEREVAP is sold on the local market and a portion of the proceeds is allocated to the maternal-child health program. VAP pays "rent" to the MCH program also when it uses the extruder to produce other products. CEREVAP is available to poor consumers through small vendors but the poorest population probably cannot afford to buy it.

In the MCH centers, a corn soy weaning food similar to CEREVAP is sold to clients on a sliding scale based on need. The growth monitoring component of the MCH services is a central MCH activity and is used to educate mothers about feeding their children. At present, the maize used in the MCH program derives from food aid, but it is planned to phase over into locally grown maize as local production increases. At present the project is restricted to the slums of Kinshasa but certain components of it are probably feasible nationwide. Non-governmental organizations have been vital to financial management of the program and to service delivery.

Although this program has met with financial difficulties, because of Zaire's deteriorating foreign exchange rate, it has been successful in guaranteeing low cost weaning foods to needy consumers both through distribution at MCH clinics and through the market. CEREVAP is the only manufactured weaning food made from local ingredients and therefore was able to maintain a low price after devaluation.

Senegal Growth Promotion[15]

In one region of Senegal, the Food and Applied Nutrition Service (SANAS) has undertaken first-rate operations research in the context of a growth promotion program to identify key determinants of program success. An experimental nutrition surveillance program was initiated in a rural community called Gniby. Through focus group discussions with men and women of several different ethnic groups, the investigators determined the priority needs and major deterrents to action. Then, before taking action they sensitized important groups of providers and clients. Then they undertook training of all levels of health personnel. Finally, they implemented their extensively piloted program in the Gniby area. The program consisted of regular weighing and discussions with mothers, searching out non-participants and providing

---

14 Zeitlin, M. S. Bogyo, R. Gold, R. Kidd and B. Nkiabungu. Interim Evaluation Report, April 1987. AID-ORT Food for Peace. Photocopy, April 1987 and Personal Communications with Carol Payne, exproject manager of this project, 1989.

15 République du Sénégal. Ministére de la Santé Publique. Direction de l'Hygiene et de la Protection Sanitaire et le Service de l'Alementation et de la Nutrition Appliquée au Sénégal (SANAS). Expérimentation d'un Modéle de Surveillance Nutritionnelle. Photocopy August 1988.

curative care for severely malnourished children.

Although the Gniby experiment was ultimately successful, in terms of service delivery, it required adaptation of the original design to local constraints--using armbands where health workers were illiterate, for instance; using mass media to involve the wider community; and strengthening the acute care system to handle increased referrals. This experiment primarily identified areas for improvement rather than measuring nutritional impact but it was so well executed that the lessons learned will be of enormous value as the country designs a nationwide growth monitoring program.

V. LESSONS LEARNED

The four programs described here differ significantly from each other in terms of program design, implementing agent, and cost recovery. Several common threads tie them all together though. First is the need to involve the community actively in program development--in Zimbabwe and Tanzania this took the form of designation of a village health committee or workers; in others the community was used as an information source.

The second common thread is the need for training in nutrition at all levels from physicians down to village health workers. Training is not a one-time event--it is a continuous recycling of personnel.

Third, all of these programs had strong growth monitoring and nutrition education components. Identifying one's child as malnourished is the first step toward taking remedial action. A variety of means were used for nutrition education; materials, hands-on food preparation, communal production, even nutrition screening was educational.

Finally, all these programs found that close supervision was important. This is more than counting the number of reports--good supervision must include regular visits to villages and health huts, discussions with clients, and observations.

Probably the most striking aspect of these four examples is the variety of institutional mechanisms used. Not only NGO's and private for profit but also political structures, traditional community organizations and new organizations like childcare centers should be considered to be potential delivery vehicles. Financing, likewise, can come from many sources--including from food aid, cross-subsidies, client fees, and client income generation. Because public finances are so tight and because the existing public health system has poor coverage and quality, it is necessary, over the short term, to look for non-traditional delivery vehicles and financing mechanisms.

Major Nutrition Policy Issues

The most important nutrition policy issue is that of nutrition's priority among all other health concerns. Not only is nutrition a major determinant of morbidity and mortality, but nutrition programs (growth monitoring in particular) can be a leading edge in gathering community participation in the health system as a whole. Yet nutrition is often a secondary concern of health policy. Food policies also often leave out nutrition concerns. Too often nutrition is left out of training programs and work plans. Nutrition must play a central role in maternal-child health programs.

There is an urgent need for nutrition training and educational materials throughout Africa.

People respond positively to well - conceived well-presented messages. Ideally the community should be involved in message development and identifying training needs. Nutrition education, moreover, empowers the household to take steps to improve its own health and nutrition. Until poverty is eliminated and public service made accessible to all, nutritional self help must be a primary mechanism for averting malnutrition.

Active village participation is necessary not only because public health system coverage is low, but also because participation gives communities a stake in project success. Moreover, often the nutritionally vulnerable groups are powerless to relieve their own nutritional stresses. The help of other individuals and community consciousness is necessary to allow them access to food and health resources.

Technological changes can help if they are properly disseminated. The ability to customize family food for the infant using power flour is a far more powerful and reliable tool than a new weaning food which has to be produced and distributed outside the family food processing cycle. In the area of micronutrients, major technical advances in fortification, in delivery of mass doses, and in minimizing the side effects of supplements make it feasible to tackle micronutrient problems.

Finally, one needs an open mind about institutional mechanisms to deliver nutrition services. NGO's, private sector, and non-health sector institutions which are reaching the target population should be considered good candidates for delivering nutrition services. Nutrition education messages can be conveyed through all manner of print, oral and visual materials.

In sum, Africa's nutrition problems require many of the same services as problems elsewhere--growth monitoring, nutrition education, targeted feeding and food fortification. Africa shares the universal need for good training, management, communications, and information systems. In Africa, however, new and innovative institutional mechanisms are needed to address the nutrition problems. Each country must look for its own institutional strengths and weaknesses in developing nutrition programs.

TABLE 1: Prevalence of Preschool Malnutrition* by Decades

	1960s	1970s	1980s
Latin America	21.6 (10)	21.2 (7)	15.3 (7)
Africa	24.6 (5)	26.3 (20)	29.5 (10)
Asia and Near East (excluding Pakistan, Bangladesh, and India	36.5 (3)	35.7 (7)	36.6 (5)
Bangladesh		91.3	71.7
Pakistan**	81.7		64
India		72.3	
World (excl. BPI)	29.3 (18)	28.8 (34)	29.2 (22)

Note: ( ) number of countries with data.

Source: McGuire, 1988

*Generally < -2Z weight for age but also <80%, < 75% weight for age and prevalence based on clinical signs.

**1980s data based on Sanghvi, personal communication, 1988.

See Appendix Table 1.

TABLE 2: Proportion of Nutrition Problem found in Rural Areas of Africa
(% of all malnourished children who live in rural areas)

Lesotho	1976	95% (1)
Sierra Leone	1978	83% (1)
Mali	1987	84% (2)
Senegal	1986	75% (2)
Burundi	1987	98% (2)

Sources: (1) CDC Survey, Children under 5 years of age weighing less than 80% weight for age; (2) DHS Survey, Children under 3 years of age weighing less than -2 s.d. weight for age.

TABLE 3: **ESTIMATED PREVALENCE OF ANAEMIA BY GEOGRAPHIC REGION AND AGE/SEX CATEGORY, AROUND 1980 (POPULATION DATA IN MILLIONS)**

REGION	CHILDREN				MEN		WOMEN			
	0-4 years		5-12 years		15-59 years		15-49 years			
							Pregnant		All	
	%	Number	%	Number	%	Number	%	Number	%	Number
Africa	56	48.0	49	47.3	20	23.4	63	11.3	44	46.8
Latin America	26	13.7	26	18.1	13	12.8	30	3.0	17	14.7
East Asia*	20	3.2	22	5.6	11	6.1	20	0.5	18	8.4
South Asia	56	118.7	50	139.2	32	123.6	65	27.1	58	191.0
World*	43	193.5	37	217.4	18	174.2	51	43.9	35	288.4
Developed regions	12	10.3	7	9.1	3	12.0	14	2.0	11	32.7
Developing regions	51	183.2	46	208.3	26	162.2	59	41.9	47	255.7

NOTES: * Excluding China. All calculations were made before rounding, figures may thus not add to totals.

Anaemia is defined as a haemoglobin concentration below WHO reference values for age, sex, pregnancy status.

Regions are drawn according to United Nations regions; more developed regions include Northern America, Japan, Europe, Australia, New Zealand, and the Union of Soviet Socialist Republics.

Prevalence rates are estimated from the various studies.

Source: E. DeMaeyer & M. Adiels-Tegman (1985). The Prevalence of Anaemia in the World. Rapp. trimest. statis. sanit. mond. 38:302-316.

TABLE 4: Estimated prevalence of iodine deficiency disorder by region and numbers of persons at risk (in millions)

	At Risk	Goiter	Overt Cretinism
South-east Asia	280	100	4.0
Asia (other countries)	400	30	0.9
Africa	227	39	0.5
Latin America	60	30	0.3
Eastern Mediterranean	33	12	N/A
Total	1,000	211	5.7

Source: WHO (1990). Global Status of Iodine Deficiency Disorders, 1989, Draft Report for the World Health Assembly.

TABLE 5: Proportion of Low Birth Weight by Region, Weighted by Number of Live Births (in percent)

	1979	1982
Subsaharan Africa	15.8	15.6
Asia-Near East	28.4	28.7
Latin America & Caribbean	10.9	10.9
Average	25.1	25.2
U.S.	7.4	6.9

Source: "The Incidence of Low Birth Weight: An Update," Weekly Epidemiology Record 27 (6 July 1984): 205-211.

TABLE 6: Distribution of Inadequate Diets by Region, 1980

	(A) < 90% FAO requirement		(B) < 80% FAO requirement		
	Millions	% Total population	Millions	% Total population	(B) as % of (A)
Africa	150	(44)	90	(25)	60
East Asia and PRC	40	(14)	20	(7)	50
South Asia	470	(50)	200	(21)	43
Middle East & N. Africa	20	(10)	10	(4)	50
Latin America	50	(13)	20	(6)	40

Source: Poverty and Hunger. Washington, D.C.: World Bank, 1986.

TABLE 7: Nutritional Status of Children Under 3 and Children 12-23 Months Old

	Weight For Age Less than -2Z	
	Under 3 years	12-23 Months
Burundi	38.3	43.5
Senegal	21.6	27.7
Mali	31.0	40.4

Source: DHS Surveys

APPENDIX

TABLE 1: Percent Malnourished Children in Africa

Country	% Malnourished	Wt/Age Standard	Sample Size	Ages	Survey Type	Date	Ref.
Africa							
[Angola]	[N/A]						
[Benin]	[35.0]	<80% RefStand.	N/A*	0-4.99yrs	Clinics*	1987	G
[Botswana]	[15.0]	<80% RefStand.	N/A*	0-4.99yrs	National	1987	G
[Burkina Faso]	[45.5]	<80% RefStand.	N/A*	0-4.99yrs	Clinics*	1987	G
Burundi	38.3	<-2S.D. NCHS	1930	.25-2.99yrs	National	1987	I
[Cameroon]	[17.3]	<-2S.D. NCHS	4688	.25-3.99yrs	National	1978*	K
Cape Verde	13.6	<-2S.D. NCHS	11611	0-3.99yrs	National	1985	K
[Cen.Afr.Rep	[39.4]	N/A*	N/A*	N/A*	National	1972*	A
[Chad]	[N/A]						
[Comoros]	[22.2]	<-2S>D. NCHS	1624	0-1.99yrs	Local*[1]	1982	K
Congo	23.5	<-2S.D. NCHS	2429	0-4.99yrs	National	1987	K
Cote D'Ivoire	12.4	<-2S.D. NCHS	1947	0-4.99yrs	National	1986	R
[Djibouti]	[N/A]						
Ethiopia	38.1	<-2S.D. NCHS	2863	0-4.99yrs	National	1982	K
[Eq. Guinea]	[N/A]						
[Gabon]	[12.8]	<-2S.D. NCHS	1024	0-4.99yrs	Regional*[2]	1984	K
[Gambia]	[18.8]	<-2S.D. NCHS	784*	.5-2.99yrs	Urban*	1982	K
Ghana	30.7	<-2S.D. NCHS	1841	.25-2.99yrs	National	1988	I
[Guinea]	[N/A]						
Guinea-Bissau	23.4	<-2S.D. Harverd	2711	0-4.99yrs	National	1980	K
[Kenya]	[20.5]	<-2S.D. NCHS	N/A*	N/A*	National	1982	C,
Lesotho	13.2	<-2S.D. NCHS	11671	0-4.99yrs	National	1981	K
[Liberia]	[20.3]	<-2S.D. NCHS	3377	0-4.99yrs	National	1976*	K
Madagascar	32.8	<-2S.D. NCHS	1762	0-1.99yrs	National	1984	K
Malawi	30.0	<80% NCHS	6901	0-4.99yrs	National	1981	L
Mali	31.0	<-2S.D. NCHS	925	.25-2.99yrs	National	1987	I
[Mauritania]	[36.4]	<-2S.D. NCHS	948*	0-4.99yrs	N/A*	1987	M
[Mauritius]	23.9	<-2S.D. NCHS	2430	0-4.99yrs	National	1985	K
[Mozambique]	[27.0]	<-2S.D. NCHS	330	0-4.99yrs	Local*[3]	1978*	K

[1] Comoros: Ngazidja

[2] Gabon: Lambarene

[3] Mozambique: Village, Gaza Province

Country	% Malnourished	Wt/Age Stnd.	Sample Size	Ages	Survey Type	Date	Ref.
[Namibia]	[N/A]						
Niger	49.4	<-2S.D. NCHS	1672	0-4.99yrs	National	1985	K
[Nigeria]	[28.1]	<-2S.D. NCHS	1387	.5-2.99yrs	Ondo State*	1986	I
[Rwanda]	[33.0]	<80% RefStand.	N/A*	0-4.99yrs	Clinics*	1987	G
Sao Tome & Princ.	17.0	<-2S.D. NCHS	2155	0-4.99yrs	National	1986	K
Senegal	21.6	<-2S.D. NCHS	635	.5-2.99yrs	National	1986	I
Seychelles	5.7	<-2S.D. NCHS	836	0-4.99yrs	National	1987/8	K
[S.Leone]	[23.2]	<-2S.D. NCHS	4890	0-4.99yrs	National	1977/8*	K
[Somalia]	[54.1]	<-2S.D. NCHS	347*	0-4.99yrs	National/Drought*	1975*	K
[S.Africa]	[43.0]	<-2S.D. NCHS	1258	1-5yrs	Rural/Black*[4]	1984	D
[Sudan]	[55.2]	<-2S.D. NCHS	3458	0-4.99yrs	Famine Data*	1983	D
Swaziland	9.7	<-2S.D. NCHS	4133	.25-4.99yrs	National/Rural	1984	K
[Tanzania]	[48.0]	<80% NCHS	N/A*	0-4.99yrs	Regional*[5]	1984	G
Togo	24.4	<-2S.D. NCHS	1396	0-2.99yrs	National	1988	I
Uganda	23.2	<-2S.D. NCHS	3789	0-4.99yrs	Regional*[6]	1988/89	I
[Zaire]	[18.9]	<-2S.D. NCHS	33784	0-4.99yrs	District*[7]	1983	D,K
[Zambia]	[24.7]	<80% RefStand.	N/A*	0-4.99yrs	National	1984	J
Zimbabwe	11.5	<-2S.D. NCHS	2485	.25-4.99yrs	National	1988	K

Note: []: data this country questionable due to factor *(sample size, unrep. sample, outdated, etc.)

Source: Galloway, R. (1991). Global Indicators of Nutritional Risk. Working Paper No. 591, PRE. The World Bank.

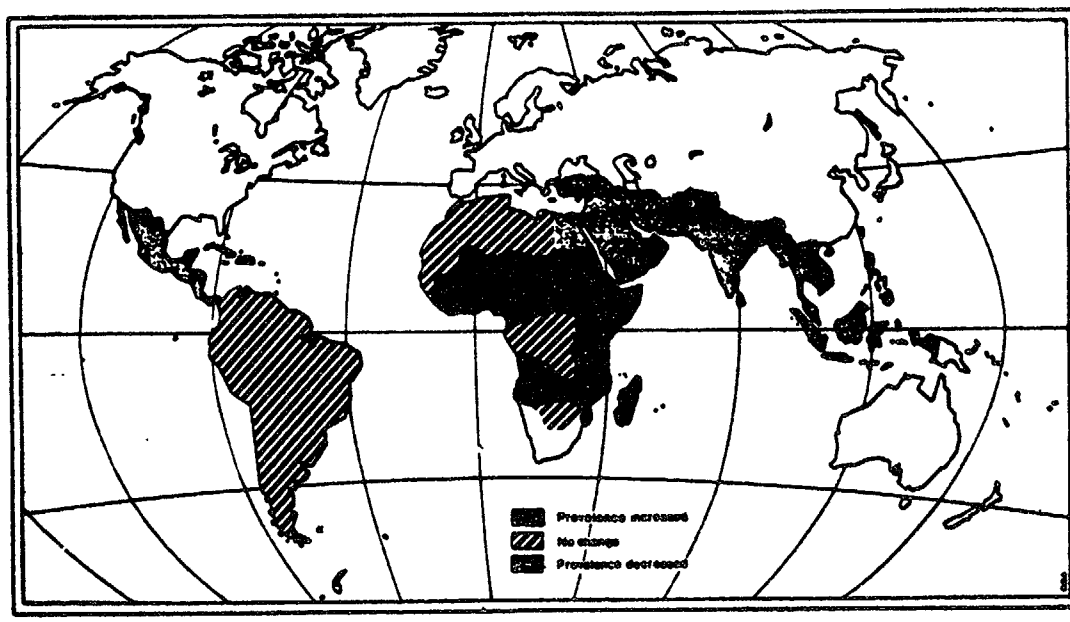
[4] South Africa: National(Rural, Black)

[5] Tanzania: Iringa Province only

[6] Uganda: excludes nine Northern districts for security reasons

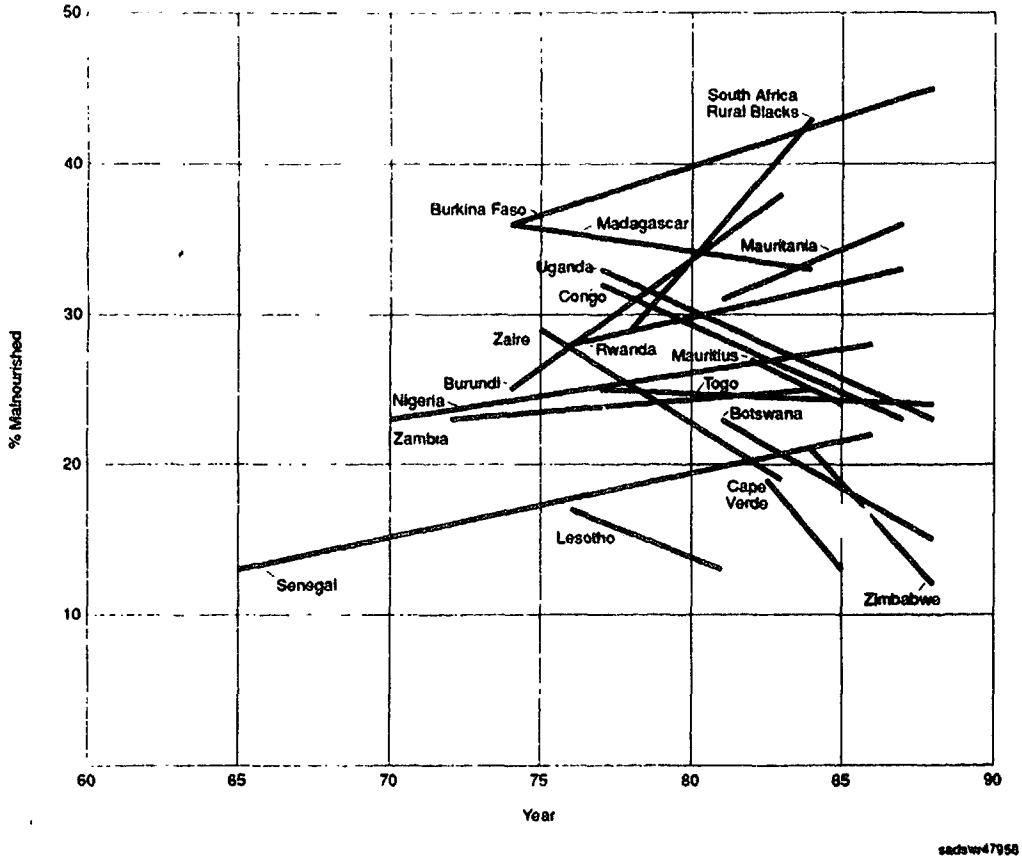
[7] Zaire: Kasongo

Figure 1: Changes in Prevalence of Underweight Children by Groups of Countries from 1980 to 1984.



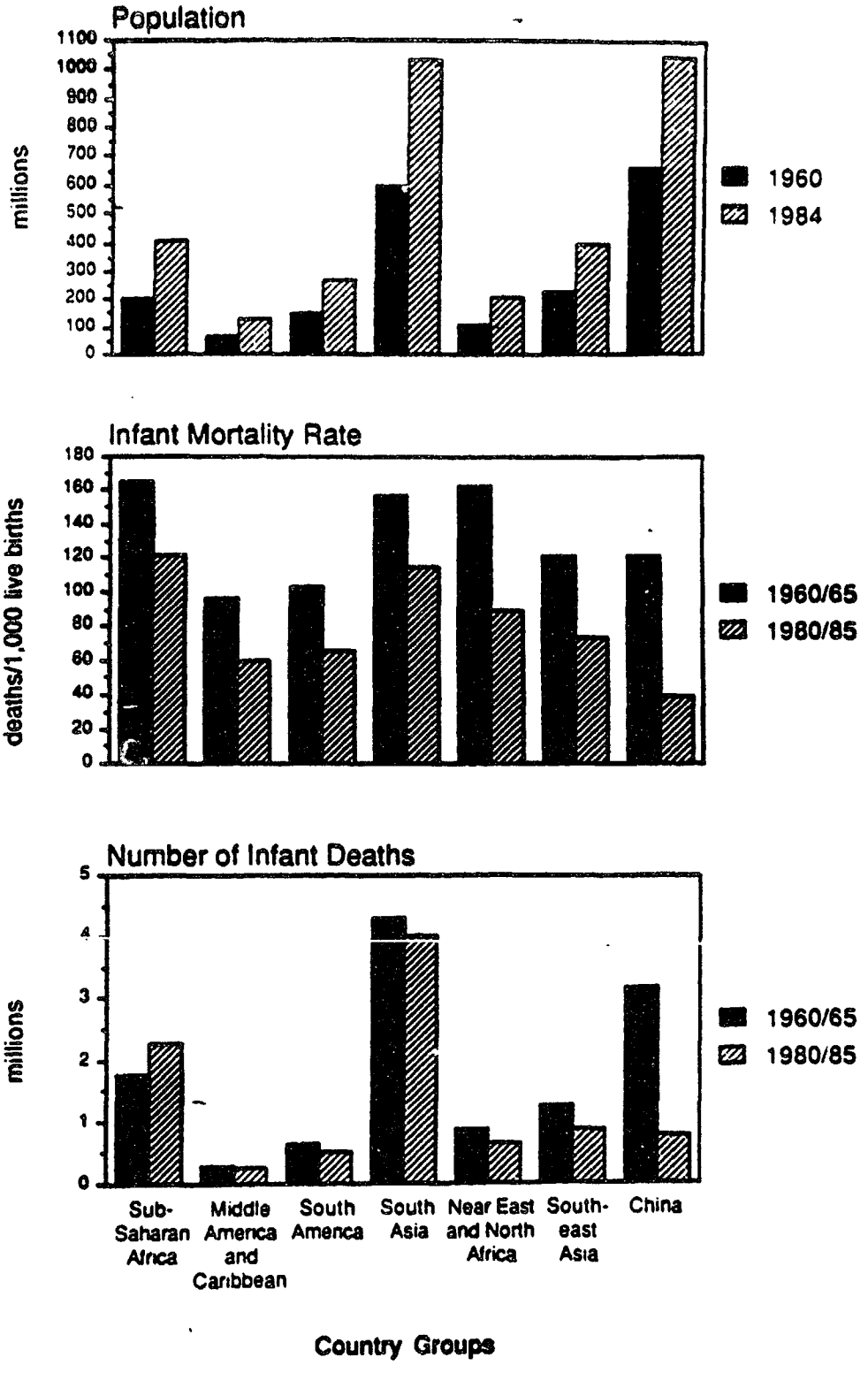
Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

Figure 2: **Change in Malnutrition Prevalence in Africa**



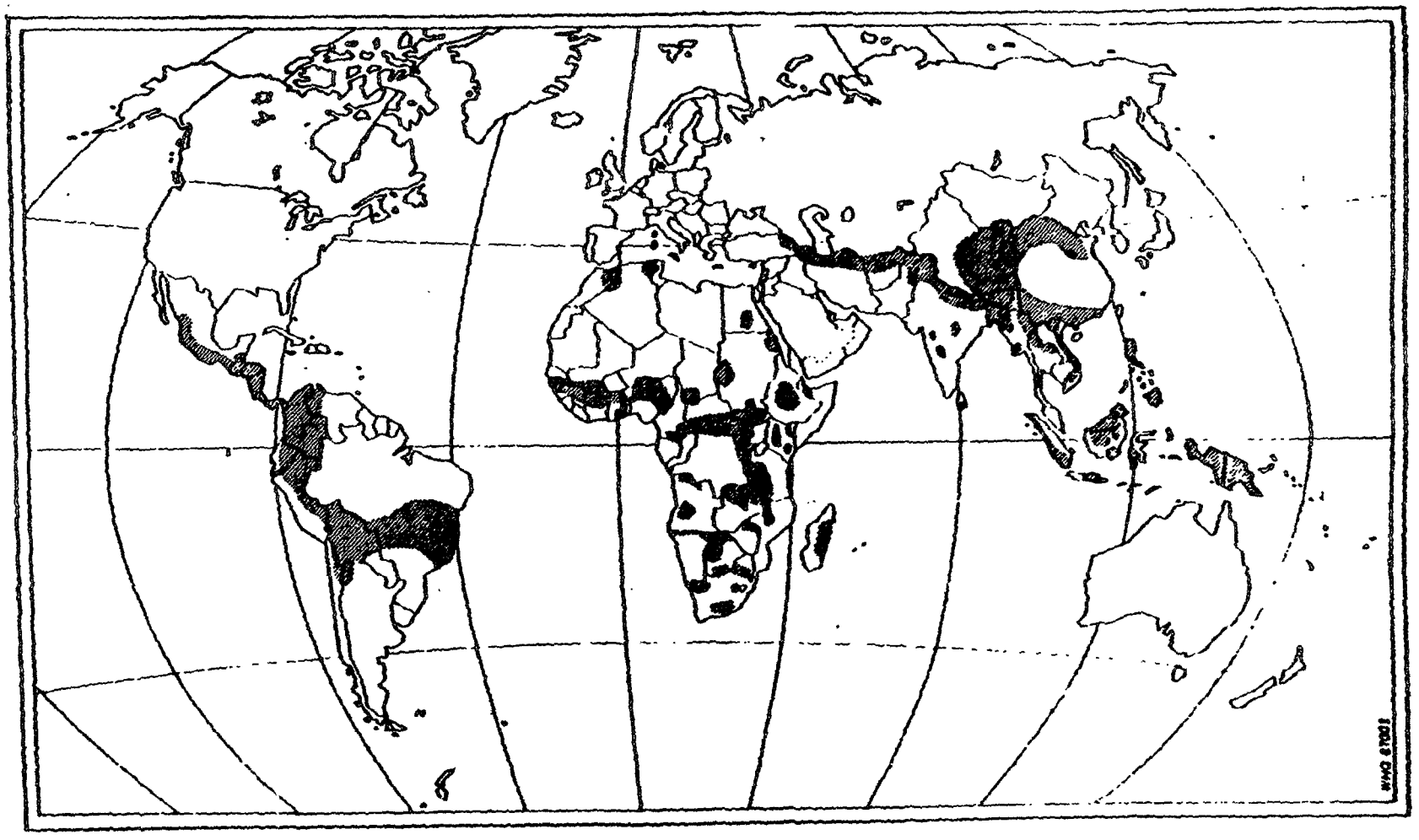
Source: Galloway, R. (1990). Unpublished. The World Bank.

FIGURE 3: Changes in Total Population, Infant Mortality Rates, and Number of Infant Deaths Since 1960 by Country Groups.



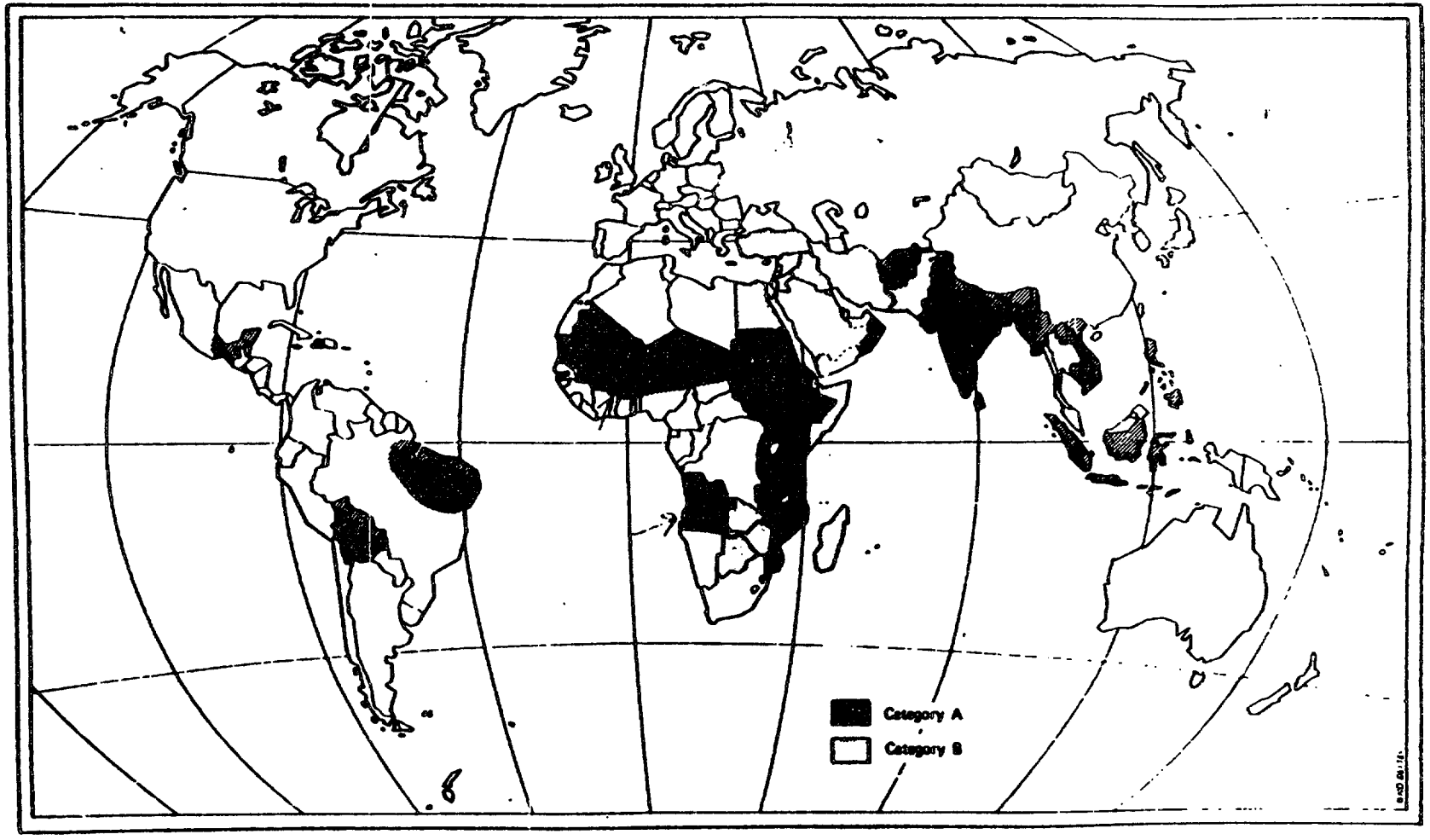
Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

FIGURE 4: Distribution of Iodine Deficient Areas in Developing Countries.



Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

FIGURE 5 The Geographical Distribution of Xeropthalmia in 1986.

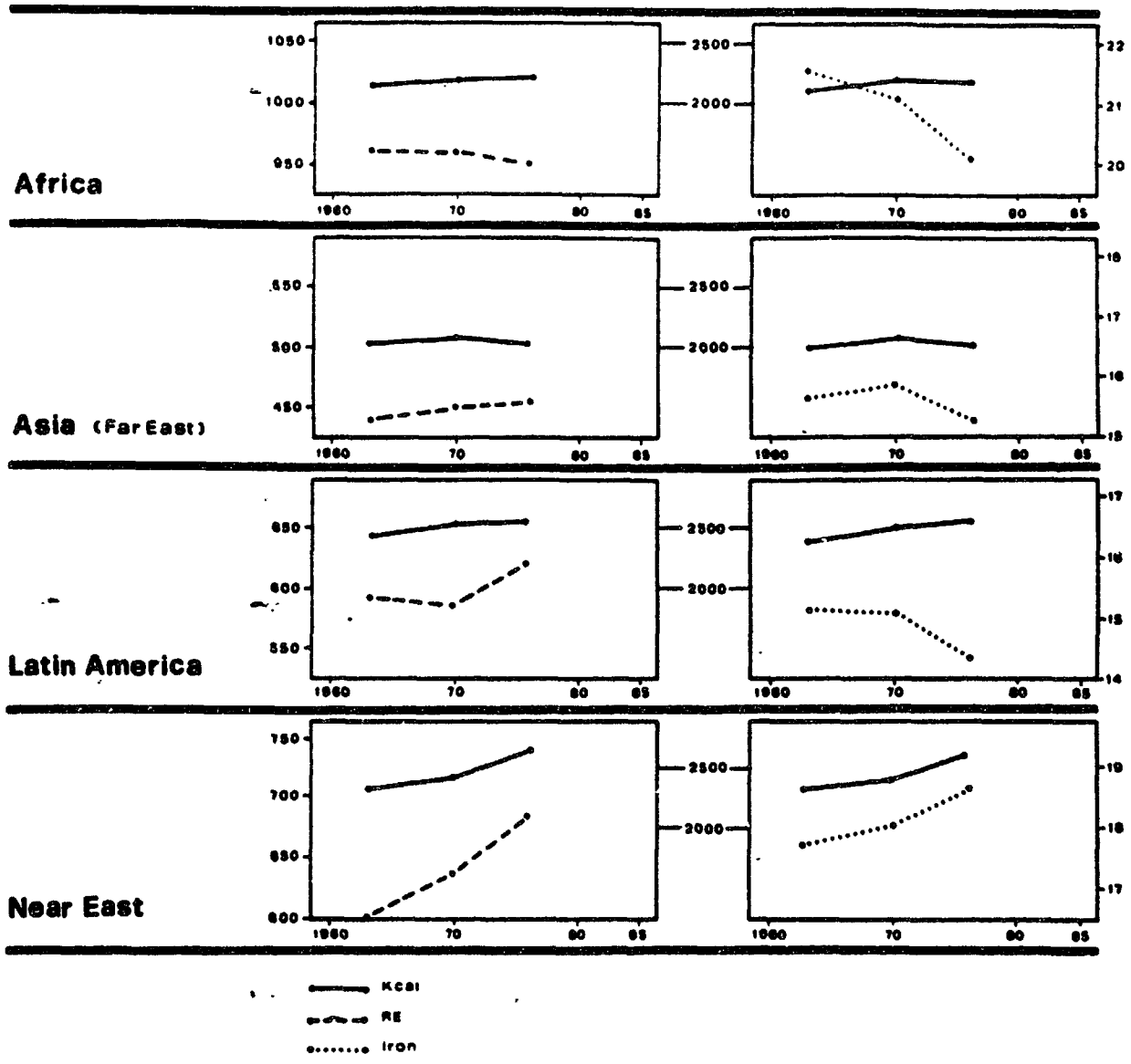


Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

FIGURES 6A & 6B Changes in Availability of Vitamin A, Iron and Kcals by FAO Region from 1960/65 to 1975/77.

A: Vitamin A (RE mcg/caput/day)

B: Iron (mg/caput/day)



Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

FIGURE 7A: Food Availability (Kcals/caput/day) in Subsaharan Africa, 1979/81.

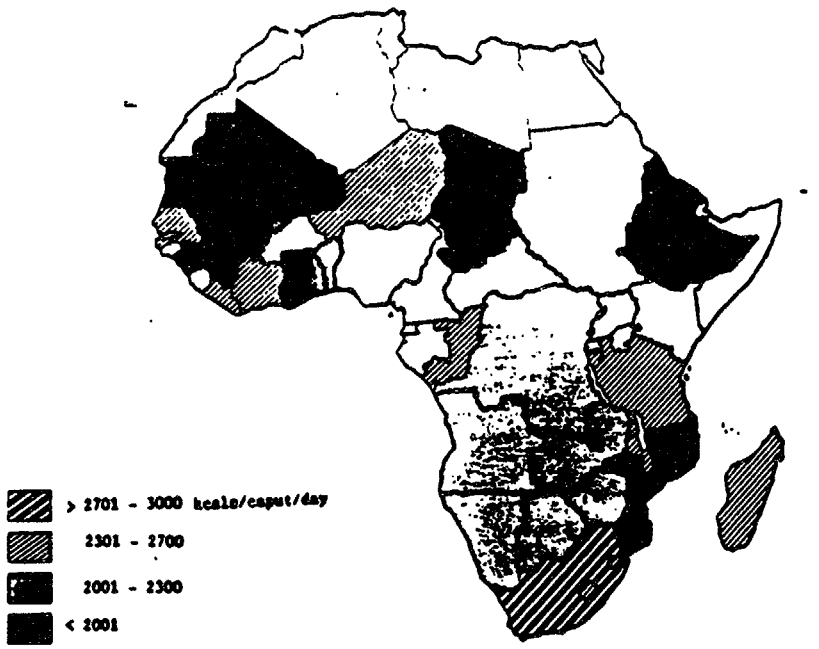
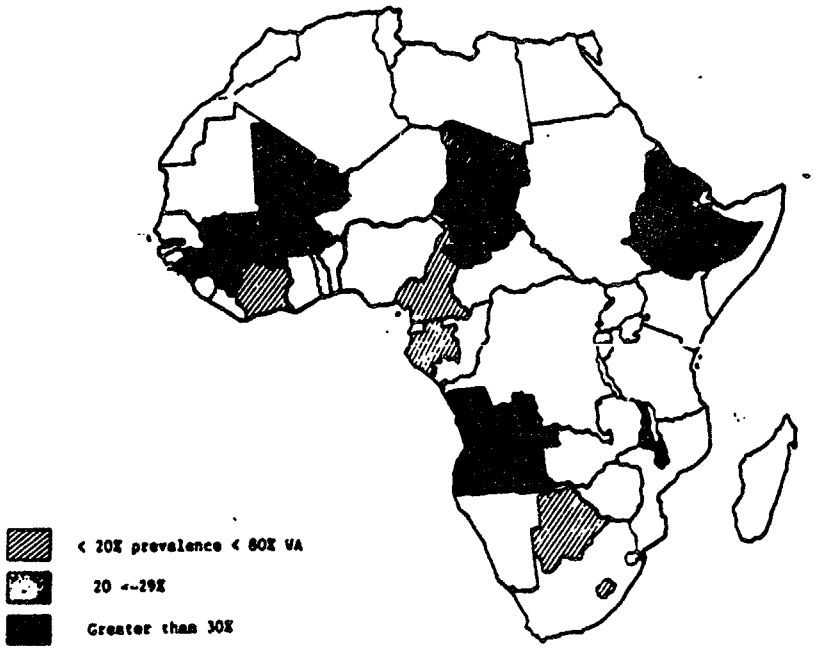
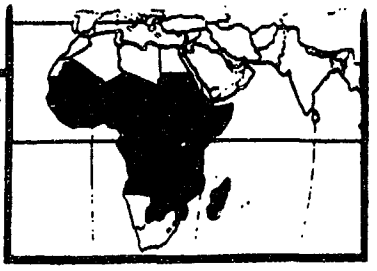


FIGURE 7B: Estimated Prevalences of Underweight Children in Subsaharan Africa, (1980). (Based on weight-for-age, WA).

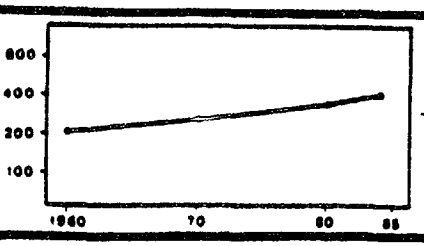


Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

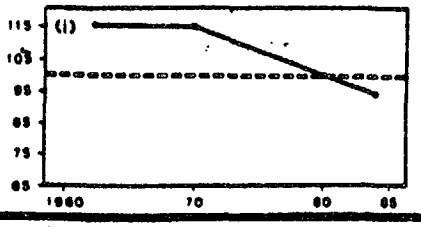
Figure 8: Sub-Saharan Africa

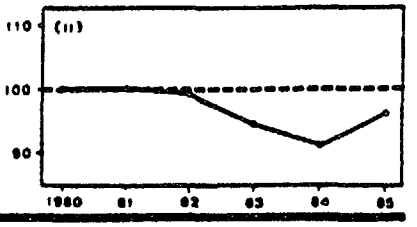


A. Total population
(millions - log scale)

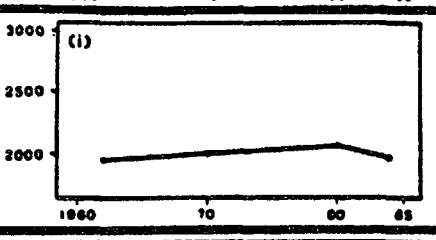


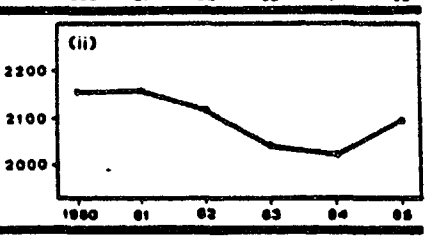
B. Index numbers of per caput food production
(1979/81 = 100)
i. 1960-85 (3-year averages)
ii. 1980-85 (annual)



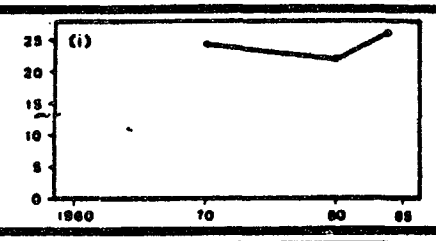


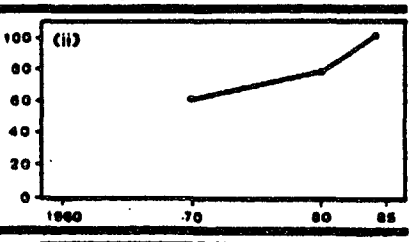
C. Dietary energy supply
(Kcals/caput/day)
i. 1960-85 (3-year averages)
ii. 1980-85 (annual)



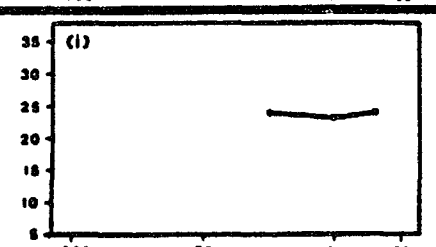


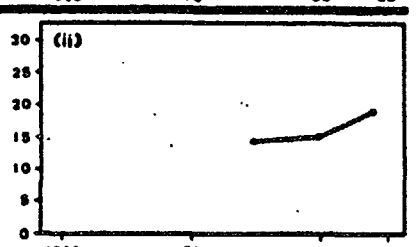
D. Undernourished population
(DES < 1.2 BMR)
i. percent
ii. numbers (millions)





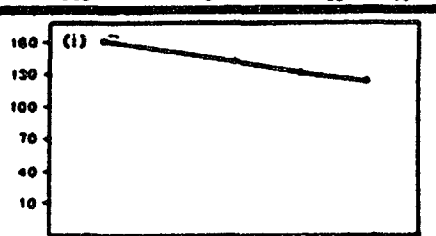
E. Underweight children
(<2 SD weight-for-age)
i. percent
ii. numbers (millions)

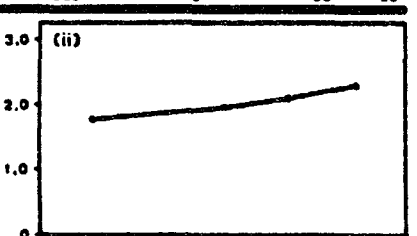




F. Infant mortality*
i. Number of deaths/ 1000 live births
ii. Number of deaths/ year (millions)

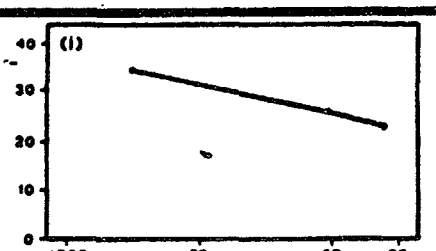
* Infants 0-12 months

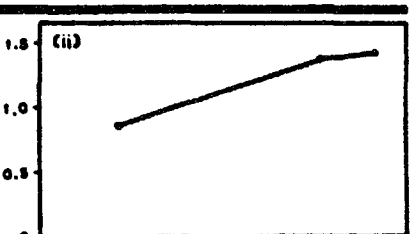




G. Child deaths*
i. Number of deaths/ 1000 children/year
ii. Number of deaths/ year (millions)

* Children 12-60 months





Source: ACC/SCN: First Report on the World Nutrition Situation. 1987.

FIGURE 9A: Prevalence of Underweight Children in Burkina Faso (1982-1985) from Clinic Data.

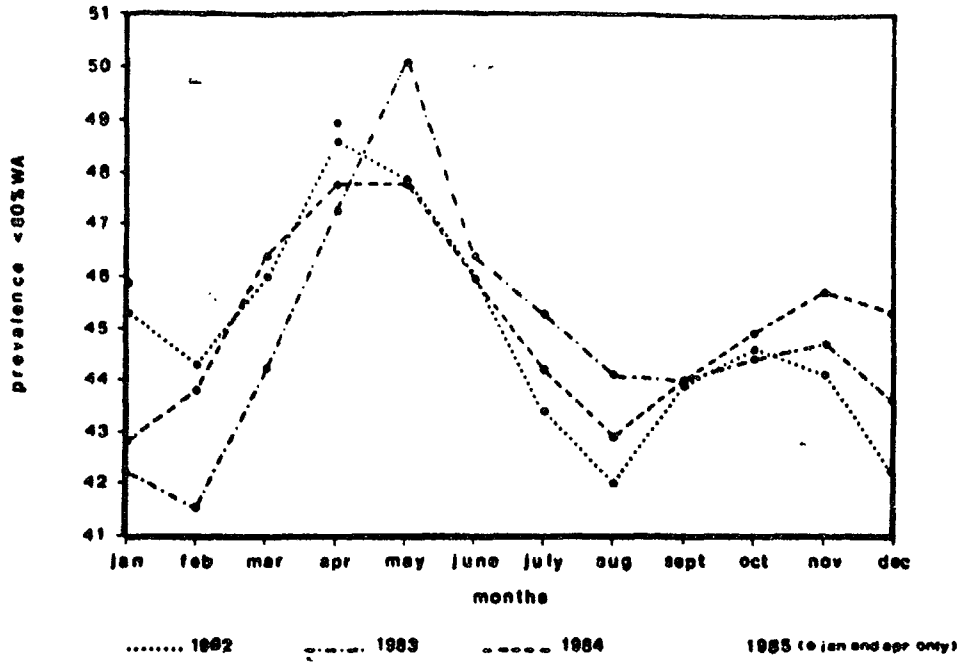
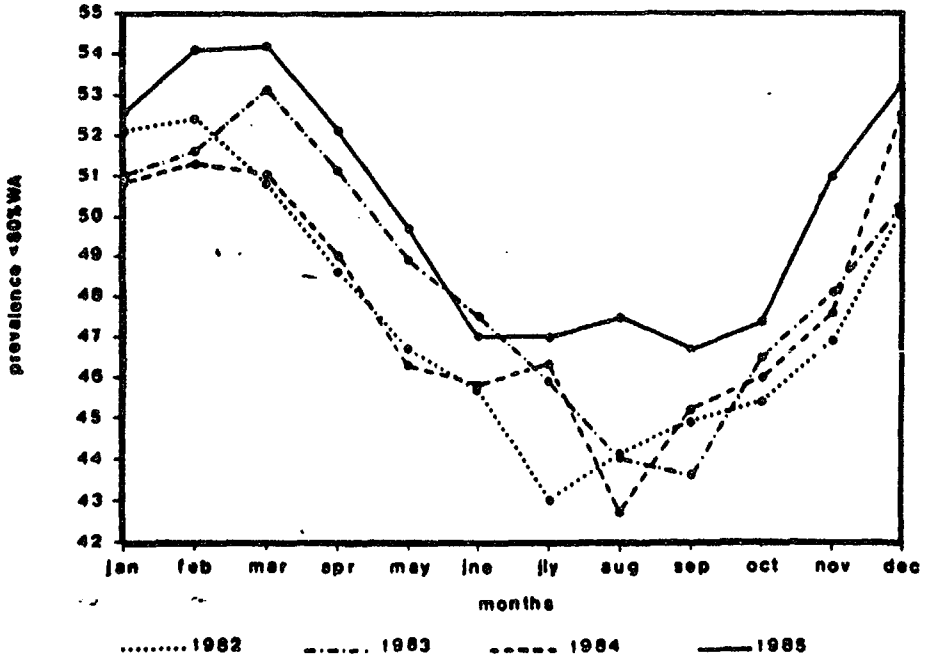
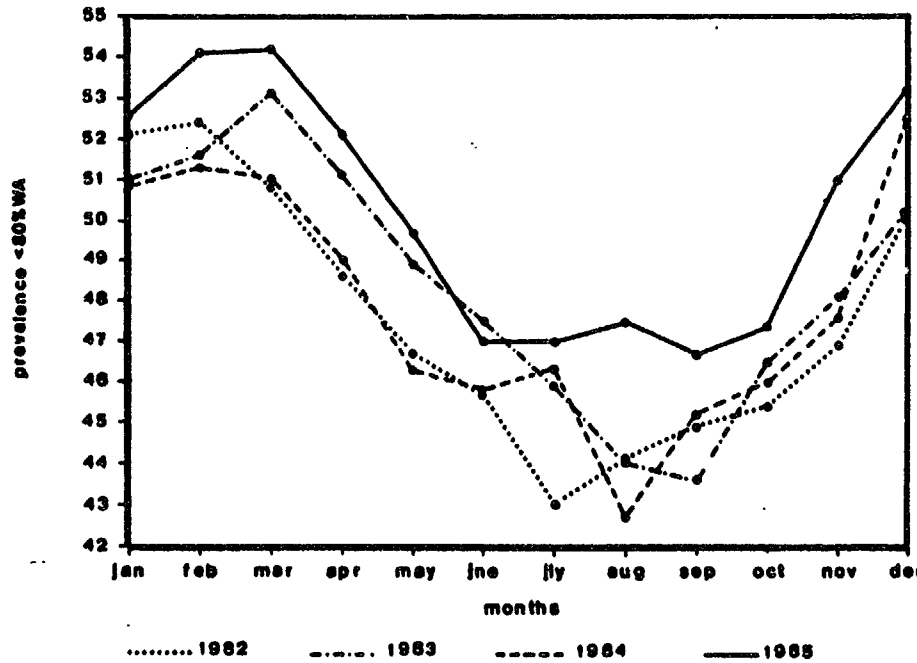


FIGURE 9B: Prevalence of Underweight Children in Madagascar (1982-1985) from Clinic Data.



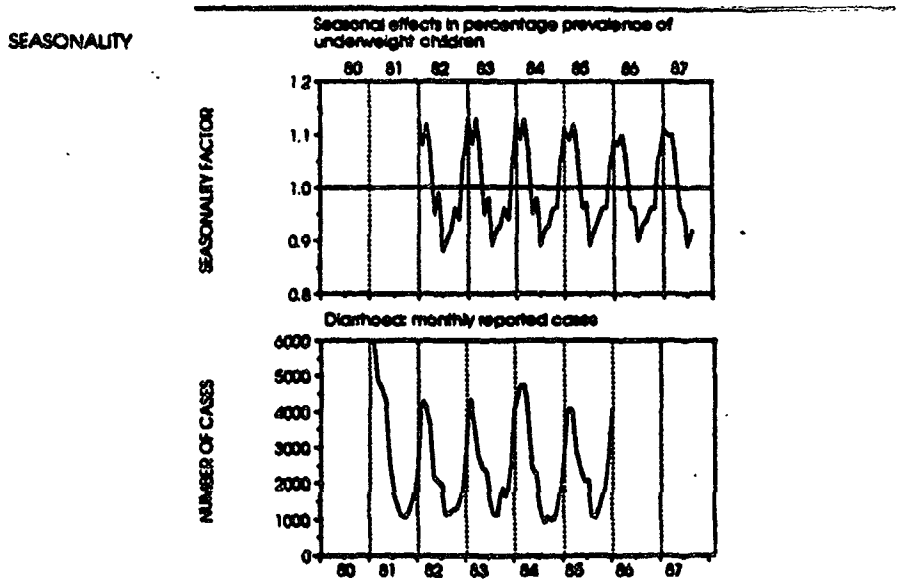
Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

FIGURE9C : Prevalence of Underweight Children in Madagascar (1982-1985) from Clinic Data.



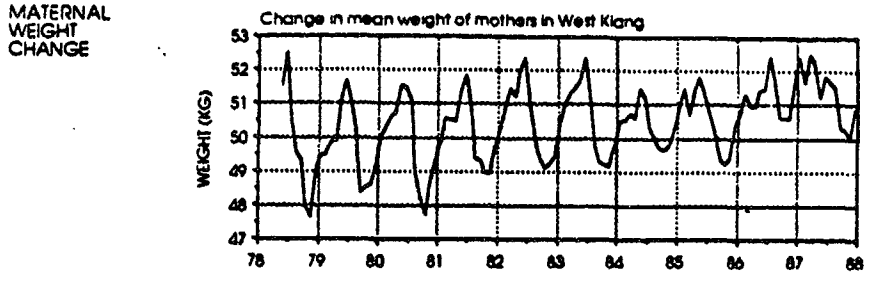
Source: ACC/SCN; First Report on the World Nutrition Situation, 1987.

Figure 10: Lesotho: Weight and Diarrheal Morbidity
Seasonal and Annual Trends



Source: UN/ACC/SCN. Update on the Nutrition Situation.
Recent Trends in Nutrition in 33 Countries. 1989.

Figure 11: Gambia: Maternal Weight Change
Seasonal and Annual Trends



Source: Update on the Nutrition Situation. Recent Trends in Nutrition in 33 countries. ACC/SCN, 1989.

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS702	Should Price Reform Proceed Gradually or in a "Big Bang?"	Sweder van Wijnbergen	June 1991	M. Stroude 38831
WPS703	The Political Economy of Fiscal Policy and Inflation in Developing Countries: An Empirical Analysis	Sebastian Edwards Guido Tabellini	June 1991	A. Bhalla 37699
WPS704	Costs and Finance of Higher Education in Pakistan	Rosemary Bellew Joseph DeStefano	June 1991	C. Cristobal 33640
WPS705	What Causes Differences in Achievement in Zimbabwe's Secondary Schools?	Abby Rubin Riddell Levi Martin Nyagura	June 1991	C. Cristobal 33640
WPS706	Successful Nutrition Programs in Africa: What Makes Them Work?	Eileen Kennedy	June 1991	O. Nadora 31091
WPS707	Population, Health, and Nutrition: Fiscal 1990 Sector Review	Population, Health, and Nutrition Division, Population and Human Resources Department	June 1991	O. Nadora 31091
WPS708	Nongovernmental Organizations and Health Delivery in Sub-Saharan Africa	Jocelyn DeJong	June 1991	O. Nadora 31091
WPS709	An Empirical Macroeconomic Model for Policy Design: The Case of Chile	Luis Serven Andres Solimano	June 1991	S. Jonnakuty 39074
WPS710	Urban Property Tax Reform: Guidelines and Recommendations	William Dillinger	June 1991	V. David 33734
WPS711	Financial Reform in Socialist Economies in Transition	Millard Long Silvia B. Sagari	June 1991	M. Raggambi 37657
WPS712	Foreign Direct Investment in Developing Countries: Patterns, Policies, and Prospects	Thomas L. Brewer	June 1991	S. King-Watson 31047
WPS713	The Determination of Wages in Socialist Economies: Some Microfoundations	Simon Commander Karsten Staehr	June 1991	O. Del Cid 39050
WPS714	Women in Forestry in India	Ravinder Kaur	July 1991	A. Sloan 35108
WPS715	Promoting Girl's and Women's Education: Lessons from the Past	Rosemary Bellew Elizabeth M. King	July 1991	C. Cristobal 33640
WPS716	Financing Training: Issues and Options	Christopher Dougherty Jee-Peng Tan	July 1991	C. Cristobal 33640

PRE Working Paper Series

	Title	Author	Date	Contact for paper
WPS717	Does Financial Liberalization Really Improve Private Investment in Developing Countries?	Jacques Morisset	July 1991	S. King-Watson 31047
WPS718	Impact of Investment Policies on German Direct Investment in Developing Countries: An Empirical Investigation	Andrea Gubitz	July 1991	S. King-Watson 31047
WPS719	How Trade and Economic Policies Affect Agriculture: A Framework for Analysis Applied to Tanzania and Malawi	Ramon Lopez Ridwan Ali Bjorn Larsen	July 1991	M. Gunasekara 32261
WPS720	The Outlook for Commercial Bank Lending to Sub-Saharan Africa	Ellen Johnson Sirleaf Francis Nyirjesy	July 1991	S. King-Watson 31047
WPS721	The Demand for Money in Developing Countries: Assessing the Role of Financial Innovation	Patricio Arrau José De Gregorio Carmen Reinhart Peter Wickham	July 1991	S. King-Watson 31047
WPS722	Is Rice Becoming an Inferior Good? Food Demand in the Philippines	Merlinda D. Ingco	July 1991	P. Kokila 33716
WPS723	Improving Women's and Children's Nutrition in Sub-Saharan Africa: An Issues Paper	Olayinka Abosede Judith S. McGuire	July 1991	O. Nadora 31091
WPS724	Fiscal Issues in Adjustment: An Introduction	Riccardo Faini Jaime de Melo	July 1991	D. Ballantyne 37947